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A State of the Environment Fact Sheet

Urbanization of Rural Land in Canada, 1981–86

Monitoring land-use change

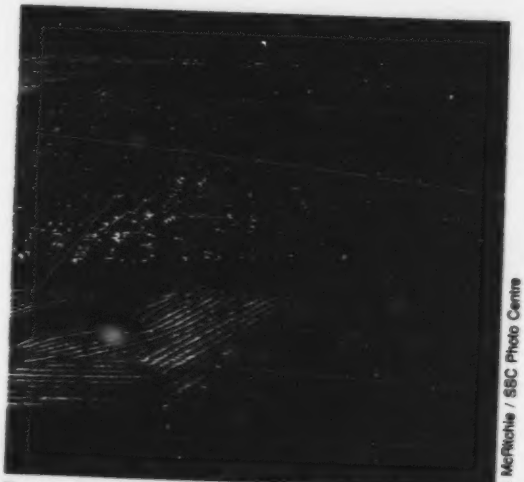
> Land use is one of the most direct ways to examine changes in environmental quality. Changes measured over various time periods can indicate the extent to which man has modified the basic land resource.... (OECD 1988)

Although Canada is the second largest country in the world, its prime (Class 1–3) agricultural lands are limited

Between 1966 and 1986, land-use change was monitored in 70 Canadian cities with populations of more than 25 000. This has provided a valuable window on what is happening to the Canadian environment. During those 20 years, 301 440 hectares (ha) of rural land — an area three times the size of the Toronto built-up area — were converted to urban and urban-related uses. Prime renewable-resource lands, particularly agricultural lands, have been a major source of land for urbanization: approximately 58% of the rural land converted during this 20-year period had high capability for agricultural production.

These figures raise a serious question. Does the extent, rate, and location of urbanization taking place today amount to unsustainable use of Canada's environment and natural resources? In other words, are we foreclosing options for use of Canada's environment and natural resources by future generations? To answer this question, knowledge of the state of the environment — the patterns, trends, and implications of human interactions with the environment — is essential.

This fact sheet provides nation-wide data on the extent, distribution, and significance of rural lands urbanized between 1981 and 1986 by the 70 "urban-centred regions" (UCRs) monitored by Environment Canada (Map 1) and analyses urbanization trends for the entire 1966–86 period. Data on the 1966–71, 1971–76, and 1976–81 periods have been published previously (Warren and Rump 1981 and Environment Canada 1985).



J. McRitchie / SSC Photo Centre

Regina, Saskatchewan, like many other Canadian cities, was established on rich cropland

Highlights

- Between 1981 and 1986, approximately 55 200 ha of rural land were urbanized by 70 Canadian cities with populations over 25 000.
- Land with prime capability to produce crops accounted for 59% of all land converted.
- A consistent trend over the 20-year period from 1966 to 1986 has been the greater efficiency of the largest UCRs in converting the lowest proportion of rural land to urban uses per 1 000 increase in population.
- Approximately 30% of the land urbanized during 1981–86 was being farmed. Another 11% had been farmed in the past, but had been abandoned by 1981.
- Replacing the productive value of the prime agricultural land lost would mean developing and farming more than twice as much land in climatically marginal areas.

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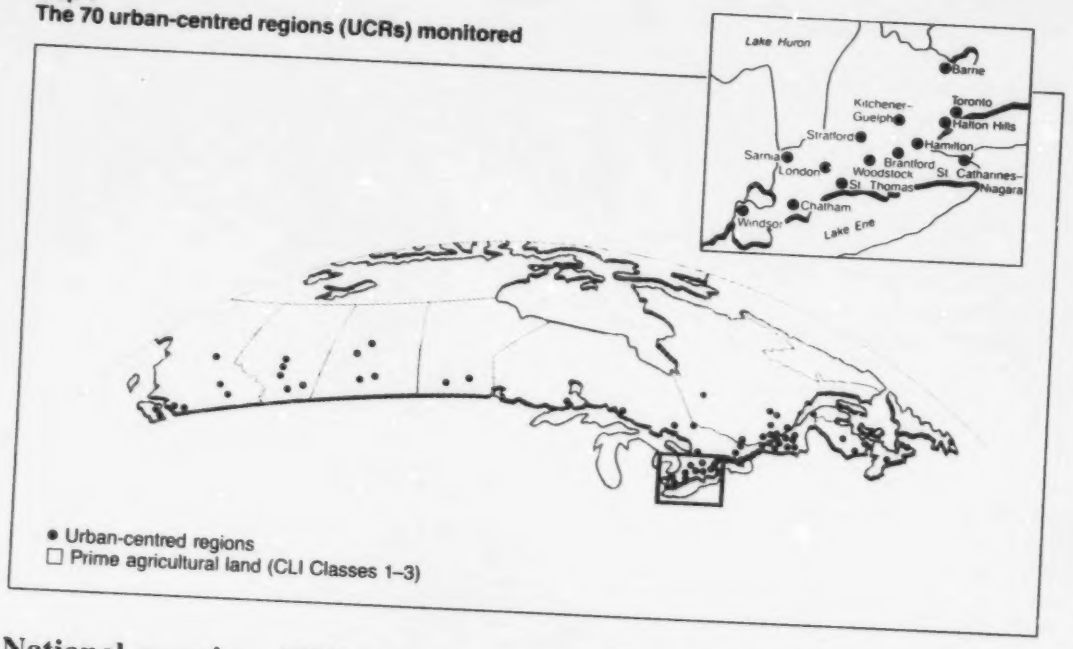
Map 1
The 70 urban-centred regions (UCRs) monitored



National overview, 1981–86

Rural-to-urban land conversion

About 51% of Canada's Class 1 agricultural land is in Ontario, principally in the southwestern portion

In Canada, the first European settlers were attracted naturally to the areas with the most agricultural potential, and the first small towns sprang up to provide services to the surrounding farms. Now the situation is reversed: the towns and cities provide the livelihood of most of the population and the very land that attracted the early settlers by its suitability for agriculture is being put to urban uses.

Urban uses include the construction of buildings and urban infrastructure, which removes the potential for renewable-resource use. The definition of urban also includes small areas that have become isolated by urbanization and are no longer economically viable for renewable-resource uses.

Between 1981 and 1986, 55 210 ha of rural land were urbanized in Canada, approximately 37% by Ontario's 26 UCRs, 25% by Alberta's 5 UCRs, and 24% by UCRs in British Columbia and Quebec combined.

In Alberta, the area of the UCRs expanded by an average of 9.7%, the greatest percentage increase of any of the provinces. Ontario's 26 UCRs grew by an average of 5.7%, and Quebec's 16 UCRs increased by 3.2% (Figure 1).

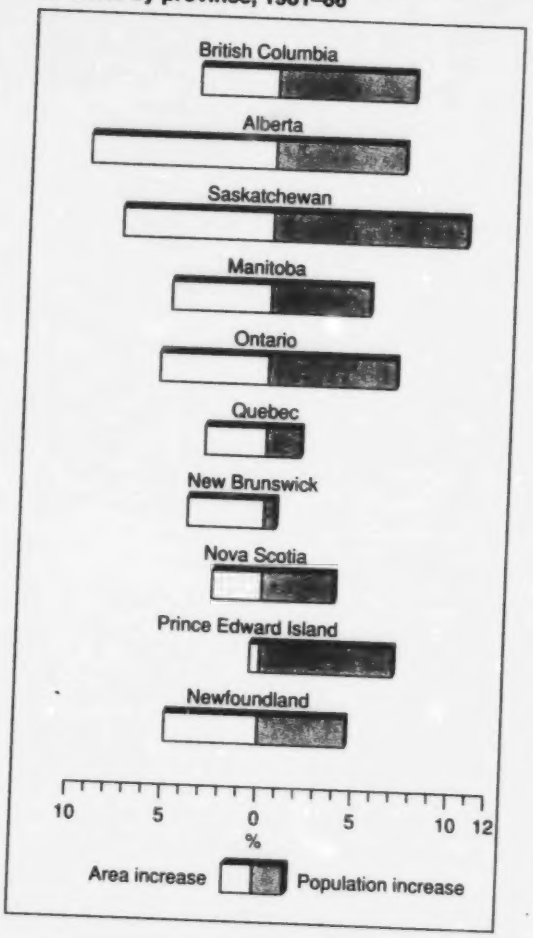
These figures do not reflect the magnitude of actual urban growth in the various provinces, which was largest in Ontario. In the 1981–86 period, 4 134 ha of rural land per year were converted in Ontario — an area 1.5 times that absorbed annually in Alberta and 3 times that in Quebec.

By 1986, approximately 17 million people, or 67% of Canada's population, lived within the 70 UCRs with populations greater than 25 000 (Map 1) and they occupied 1 036 175 ha, or about 0.1% of the total land base of Canada (992 million ha). These centres will likely continue to expand onto valuable renewable-resource lands, with resulting land-use conflicts and irretrievable loss of high capability farmland, forest land, and wildlife habitat.

W. Barrett / SSC Photo Centre

Rural land supports a variety of uses, for example, agriculture, wildlife habitat, and recreation

Figure 1
Percentage increase in area and population of UCRs by province, 1981–86



Population and urbanization of rural land

During 1981–86, the population of the 70 UCRs increased 5.4% to 17 062 118 (Statistics Canada 1986). The percentage population increases were highest in Saskatchewan (10.2%), British Columbia (7.2%), and Prince Edward Island (7.0%). Despite having the largest individual percentage increases, the combined population change in UCRs in these three provinces accounted for only 20.5% of the total for all 70 UCRs. Ontario's UCR population grew by 6.7%, but this accounted for 51.5% of the total. The 7% population increase in Prince Edward Island's only UCR (Charlottetown) accounted for just 0.3% of the national total.

Overall, the population density of UCRs increased from approximately 15 persons/ha to 16.5 persons/ha. (By comparison, the nation's overall population density is 0.03 persons/ha.) But population growth varied greatly between UCRs (Figure 2).

The Toronto UCR showed the largest absolute increase in urban population (286 529), followed by Vancouver (112 546), Ottawa-Hull (71 370), and Montreal (60 982). Some UCRs, mainly resource-based, actually declined in population between 1981 and 1986. Perhaps because of the downturn in the economy and high interest rates, population decreased in 16 UCRs: eight centres in Quebec, five in Ontario, and one each in New Brunswick, Nova Scotia, and British Columbia.

Predictably, the most populous UCRs (where land commands the highest prices) converted land most efficiently. Nine centres with populations over 500 000 accounted for 78% of the population increase and absorbed 66% of the total rural land. In contrast, the 26 smallest centres accounted for only 1.6% of the population change and 6.0% of the total rural land converted.

A useful measure of the efficiency of land conversion can be derived by measuring the number of hectares of rural land converted per 1 000 increase in urban population. A high rate indicates that large areas of rural land are being urbanized by a relatively small increase in population, suggesting low-density use of land.

By this measure, between 1981 and 1986, the 70 UCRs converted rural land at a rate of 64 ha/1 000 increase in population, almost one-half that of the previous five-year period (119 ha/1 000 population increase). During 1981–86, the largest UCRs took over 53 ha of land for every 1 000 increase in population, whereas the smallest centres converted 242 ha/1 000 increase in population (Table 1).

The highest rate of rural land conversion in Canada — 979 ha/1 000 population increase — occurred in New Brunswick. Alberta urbanized the second largest area per 1 000 population — 132 ha, followed by Newfoundland (86 ha), Quebec (82 ha), Nova Scotia (81 ha), Manitoba (66 ha), British Columbia and Saskatchewan (51 ha each), and Ontario (46 ha). Prince Edward Island had the lowest rate, 13 ha/1 000 population increase.

Figure 2
Change in area and population of selected UCRs, as a percentage of the total for all 70 UCRs, 1981–86

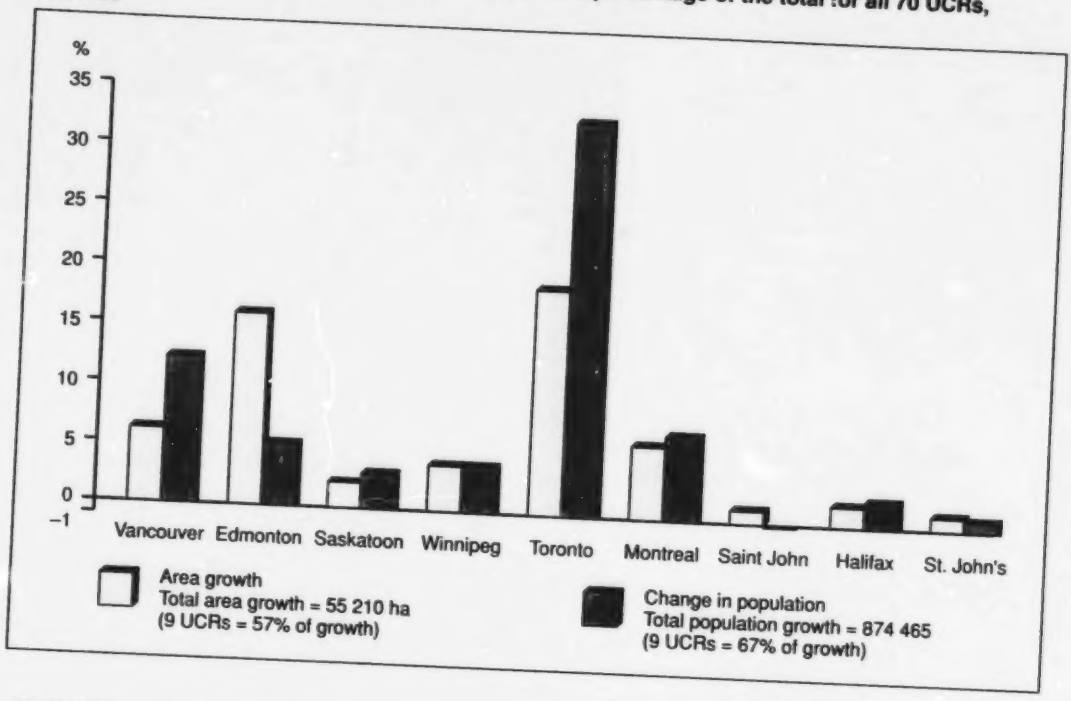


Table 1
Growth and change within UCRs grouped by population class, 1981–86

Population class (No. of UCRs)	Area increase	Population density	Population increase	Rate of land conversion
	%	pop/ha	%	ha/1000 pop. change
25 000 – 50 000 (26)	3.3	9.0	1.5	242
50 001 – 100 000 (18)	4.0	9.8	2.9	141
100 001 – 250 000 (13)	4.9	12.8	3.6	104
250 001 – 500 000 (4)	3.2	12.4	5.2	50
> 500 000 (9)	6.6	19.5	6.3	53
Average for 70 UCRs	**5.4**	**16.5**	**5.4**	**64**

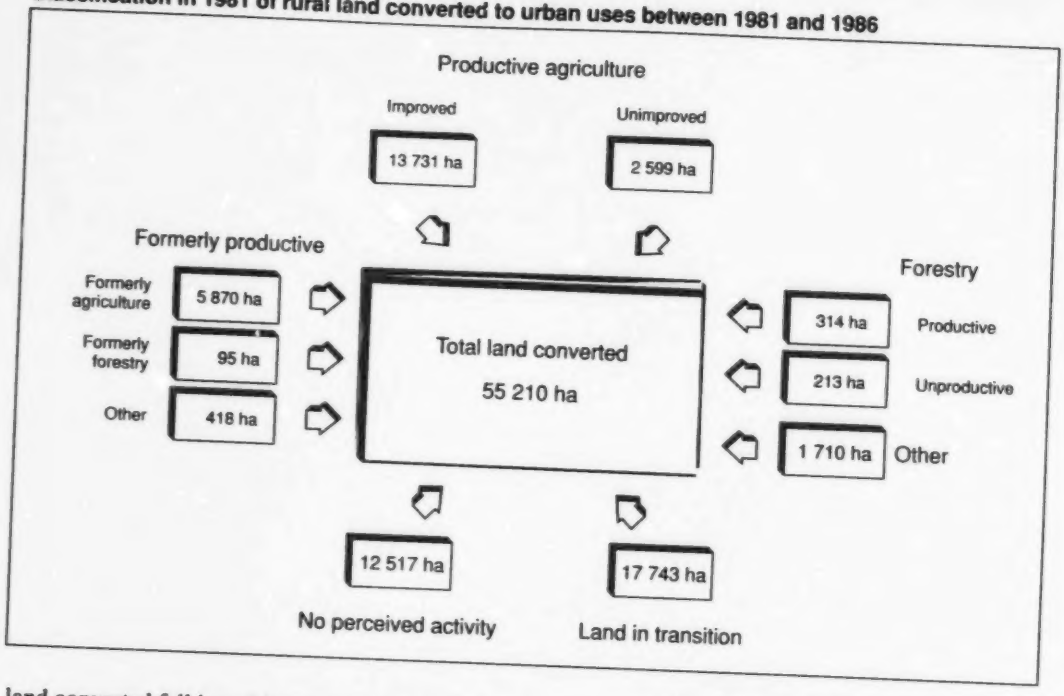
Thirty percent of the land converted to urban uses between 1981 and 1986 had been used for productive agriculture

Former uses of urbanized land

Environment Canada's monitoring shows that 30% of the land converted to urban uses between 1981 and 1986 had been used for productive agriculture in 1981 (Figure 3). Annual tillage crops were grown on 44% of this land; another 43% was in improved grasslands (pasture and forage), and the remainder was unimproved grasslands (rough pasture). Ontario's UCRs absorbed almost half of the land used for productive agriculture, including over 3 400 ha of land that had been growing annual tillage crops. Alberta's UCRs converted another one-quarter of the agricultural land lost, and together with UCRs in Saskatchewan and Manitoba, urbanized a total of 39% (6 295 ha). More than half the productive agricultural land lost to urbanization in the Prairie Provinces was being annually tilled.

Abandoned agricultural land made up another 11% of the land urbanized between 1981 and 1986. This land may have been abandoned because farming had become unprofitable, or it may have been taken out of production and held for urban development. The urbanization of this type of land was particularly high in Quebec, where 41% of the total

Figure 3
Classification in 1981 of rural land converted to urban uses between 1981 and 1986



land converted fell into this category. In contrast, the corresponding figure for Ontario was only 11%. Of the land absorbed in the Toronto UCR, 44% was still being actively farmed and only 15% was abandoned agricultural land.

Land in transition made up 32% (17 743 ha) of the land urbanized during the 1981–86 period. This class designates land that showed signs of human disturbance in 1981, but at that time it was not possible to identify the destined use. UCRs in Alberta and Ontario absorbed 70% of the land in transition. A high percentage of the land converted by Calgary and Edmonton (52% in each case) fell into this category.

Land with no perceived activity in 1981 accounted for 23% of the total rural land converted. Predominantly treed or covered in unimproved grasses and shrubs, this type made up 66% of rural land urbanized in Nova Scotia, 42% in British Columbia, and 33% in New Brunswick.

Implications for agricultural land

> Soil degradation has many causes but those of immediate and major concern ... are erosion, desertification, pollution and agricultural to urban land conversion. The latter is an extreme case of degradation. (OECD 1985)

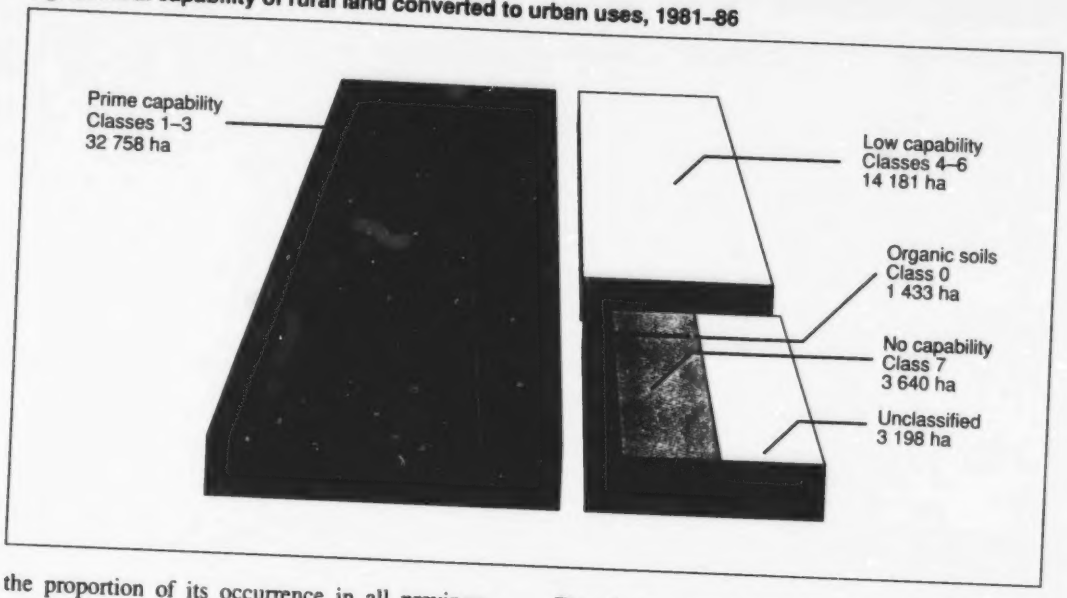
Although Canada is the second-largest country in the world, its prime agricultural lands are limited. The Canada Land Inventory (CLI) shows that, of approximately 250 million ha surveyed for renewable-resource use, 18%, or 45.9 million ha, have prime capability to produce crops (Classes 1–3). Only 4.2 million ha have the highest capability for agriculture (Class 1) (Simpson-Lewis *et al.* 1979).

The loss of this productive and limited renewable resource is a national concern. Once land has been modified for urban purposes, it is essentially no longer available for alternative renewable uses. In fact, changes to natural drainage and topography, soil compaction, and the prohibitive cost of possible rehabilitation make any future renewable-resource use highly unlikely.

Given the location of most urban areas in Canada, urbanization usually expands onto prime agricultural land (Figure 4). In fact, the proportion of prime capability (Classes 1–3) agricultural land converted to urban uses in 1981–86 was greater than

Once agricultural land has been modified for urban purposes, it is essentially no longer available for farming

Figure 4
Agricultural capability of rural land converted to urban uses, 1981–86



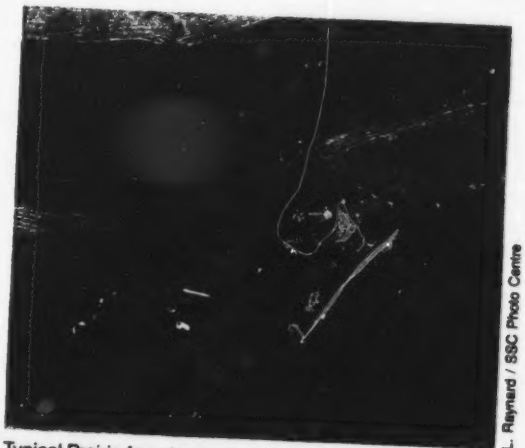
the proportion of its occurrence in all provinces combined (59% vs 18%) and in all provinces individually, except P.E.I. (Figure 5). This difference was greatest in Manitoba and Ontario. For example, although only 8% of Ontario falls into CLI Classes 1–3, 83% of the land urbanized in Ontario fell into those categories.

Prime agricultural lands are not uniformly distributed across Canada. For example, approximately 51% of the very best prime land (Class 1) is located in Ontario, principally in the southwestern portion. A further 46% is found in the Prairie Provinces, 2% in British Columbia, and 0.5% in Quebec. The Atlantic Provinces do not have any Class 1 lands.

Nowhere in Canada is the pressure to urbanize prime agricultural lands greater than in southwestern Ontario. A region bounded by Toronto, Barrie, and Windsor (see inset Map 1) contains approximately 90% of Ontario's Class 1 agricultural lands. Here, between 1981 and 1986, the population of 14 UCRs grew by 7%, to a total of 5.5 million people. During the same period, 14 448 ha of rural land were converted to urban uses in this region. Nearly 94% of these urbanized lands had Classes 1–3 capability for agriculture; 65% was Class 1. The Toronto UCR alone absorbed 10 047 ha of prime agricultural land in the 1981–86 period, compared with 4 036 ha in Edmonton, 2 665 ha in Montreal, and 498 ha in Vancouver.

Replacement value of agricultural lands

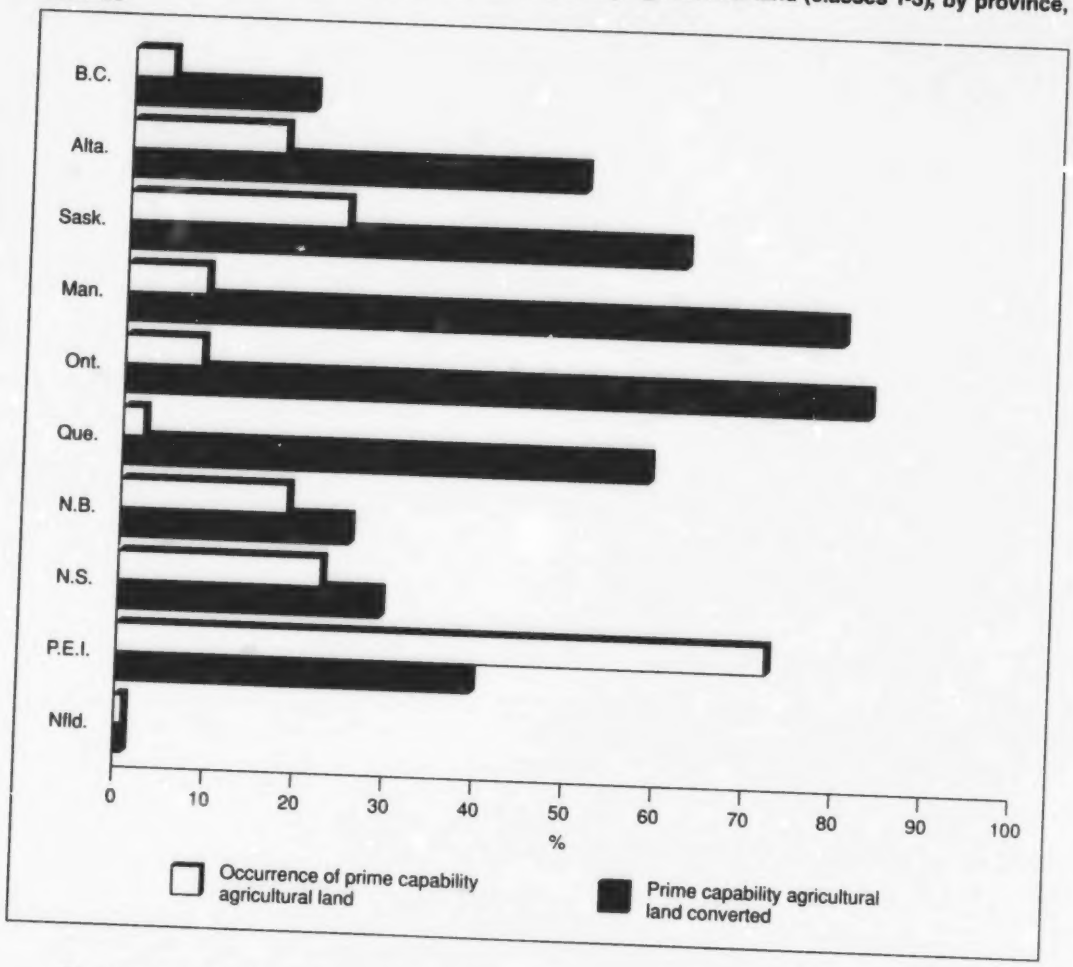
Some of Canada's best farmlands are under continuing competition from urbanization. Along with urbanization pressures, the uncertainty of national and international agricultural markets compels farmers to produce more from their land. Farmers must deal with the stress of trying to make farming economical knowing that their land could bring better financial returns to them if put to urban uses.



L. Reynard / SSC Photo Centre

Typical Prairie farm located on some of Canada's best agricultural land

Figure 5
Occurrence and conversion by UCRs of prime capability agricultural land (classes 1-3), by province, 1981–86



If prime agricultural lands are converted to urban uses, can they be economically replaced by opening up new agricultural lands in more remote areas, such as the Peace River District of western Canada and the clay belt of northern Ontario?

The CLI agricultural capability system evaluates agricultural land primarily on the basis of soils, and does not adequately consider the effects of climate on agricultural production. Specialty crops, in particular, are affected by climate. Researchers using the CLI system as a base can apply an Agroclimatic Resource Index (ACRI) to determine more accurately the value of an area for agricultural production. ACRI considers the number of frost-free days, as well as moisture shortages and inadequate summer heat. ACRI values for individual sites range from 3.0 (most suitable) in parts of southwestern Ontario to less than 1.0 in northern areas (Williams 1983).

Average provincial ACRI values range from 1.2 for Newfoundland to 2.4 for Ontario (Table 2), although ACRI values vary widely within a province. In Ontario, for example, ACRI values for individual UCRs range from 1.5 in Thunder Bay to 3.0 in Windsor.

Of the 32 758 ha of prime capability agricultural land converted to urban uses between 1981 and 1986, 63% was in areas with ACRI ratings of 2 or better. To replace these prime lands would require more than twice as much land (71 547 ha) of similar soil quality in areas where the ACRI value is 1.

Substituting new, lower-quality agricultural lands in remote areas for prime agricultural lands in UCRs would involve substantially higher costs

Table 2
Replacement of converted prime capability agricultural land with land of similar soil quality and an ACRI value of 1

Province (No. of UCRs)		Converted Class 1–3 land	Percentage of prime agricultural land converted	Provincial ACRI value	Replacement land required
		ha			ha
British Columbia	(7)	1 244	18.4	1.4	2 514
Alberta	(5)	6 761	49.6	1.6	10 769
Saskatchewan	(4)	1 368	61.9	1.4	1 922
Manitoba	(2)	1 925	79.2	1.9	3 633
Ontario	(26)	17 081	82.6	2.4	42 572
Quebec	(19)	3 671	58.6	2.0	8 930
New Brunswick	(3)	373	26.3	1.7	638
Nova Scotia	(2)	321	27.6	1.7	545
Prince Edward Island	(1)	13	38.2	1.8	23
Newfoundland	(1)	1	0.2	1.2	1
70 UCRs		**32 758**	**59.3**		**71 547**

Southwestern Ontario (14 UCRs) has the highest ACRI rating for any region in the country, averaging 2.7. To replace the Class 1–3 agricultural lands converted in this region during 1981–86 would require approximately 34 839 ha of new Class 1–3 land in regions with an ACRI value of 1. This is an area amounting to about 2.5 times the prime land urbanized in southwestern Ontario in these years, or to 64% of the total area absorbed by the 70 UCRs across the country.

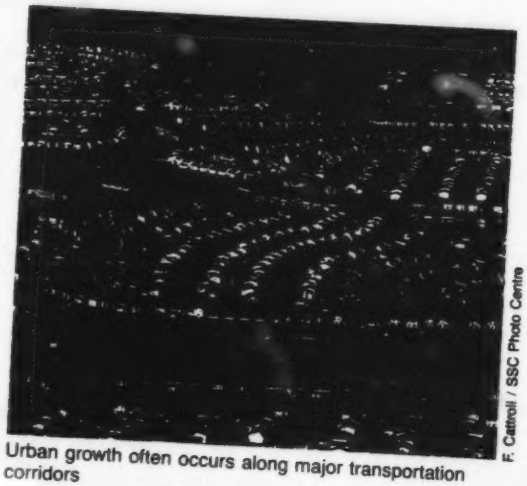
Substituting new, lower-quality agricultural lands in remote areas for prime agricultural lands in urban-centred regions would involve substantially higher costs. Extra costs would stem from the more limited types of agricultural production, as well as the increased costs of land development, energy, and transportation per unit of food produced. At present there is no indication that the agricultural industry of Canada could profit from replacement of these urbanized prime agricultural lands by more marginal areas. Indeed, some agricultural activities are currently unable to remain profitable on established prime agricultural lands even without these additional costs.

Opening up new land for agricultural production could affect other land uses, such as forestry and wildlife

In addition, opening up land for agricultural production could affect other land uses, such as forestry and wildlife. For example, since 1800, 90% of southwestern Ontario's wetlands have been drained and converted to other uses, resulting in the loss of valuable wildlife habitat (Snell 1987). Also in southern Ontario, many forests were cut by early settlers to make way for agriculture, so there is no longer a large timber industry. Similar conflicts may arise in developing some of these remote areas for agricultural purposes.

Urbanization trends, 1966–86

Environment Canada now has data on UCRs for four 5-year monitoring periods: 1966–71, 1971–76, 1976–81, and 1981–86. The data reveal that the amount of urban expansion fluctuates with economic conditions. Table 3 shows the amounts of rural land that were converted to urban uses in the 70 UCRs across Canada during each monitoring period. These amounts represent a 29% decline between the total for 1966–71 and that for 1971–76,



F. Cattroll / SSC Photo Centre

Urban growth often occurs along major transportation corridors

Table 3
Total rural land (TRL) and prime agricultural land (PAL) converted in the UCRs for four monitoring periods, 1966–86

Province (No. of UCRs)	1966–71			1971–76			1976–81			1981–86			1966–86		
	TRL	PAL		TRL	PAL		TRL	PAL		TRL	PAL		TRL	PAL	
	ha	ha	% of TRL	ha	ha	% of TRL	ha	ha	% of TRL	ha	ha	% of TRL	ha	ha	% of TRL
B.C. (7)	7 515	1 154	15	7 665	1 690	22	23 372	5 272	23	6 778	1 244	18	45 330	9 360	21
Alta. (5)	14 698	8 911	61	12 279	8 936	73	11 077	6 821	62	13 637	6 761	50	51 691	31 429	61
Sask. (4)	1 487	951	64	2 410	2 090	87	4 507	2 509	56	2 209	1 368	62	10 613	6 918	65
Man. (2)	5 199	4 733	91	1 441	1 356	94	3 975	3 433	86	2 431	1 925	79	13 046	11 447	88
Ont. (26)	36 952	29 125	79	21 260	16 558	78	27 070	20 276	75	20 670	17 081	83	105 952	83 040	78
Que. (19)	15 632	8 409	54	11 082	5 486	50	17 609	7 346	42	6 264	3 671	59	50 587	24 912	49
N.B. (3)	1 803	292	16	2 798	868	31	4 830	892	18	1 417	373	26	10 848	2 425	22
N.S. (2)	1 810	663	37	1 143	582	51	3 928	1 481	38	1 162	321	28	8 043	3 047	38
P.E.I. (1)	309	307	99	414	414	100	1 523	1 463	96	34	13	38	2 280	2 197	96
Nfld. (1)	685	—	0	672	4	>1	1 085	10	>1	608	1	>1	3 050	15	>1
70 UCRS	**86 090**	**54 545**	**63**	**61 164**	**37 984**	**62**	**98 976**	**49 503**	**50**	**55 210**	**32 758**	**59**	**301 440**	**174 790**	**58**

a 38% increase between 1971–76 and 1976–81, and a 44% decline between 1976–81 and 1981–86.

The cyclical pattern appears to follow the economic conditions of the country, whereby large amounts of rural land are urbanized during periods of prosperity and less conversion occurs during periods of slower economic growth (Figure 6). Land-use monitoring of Canada's 70 UCRs for the 1986–91 period would probably show an increase in the amount of rural land converted to urban uses. Recovery of the Canadian economy, after the recession of the early 1980s, has already spawned rapid urban growth in a number of major centres, particularly in the Toronto area.

Over the 20-year period from 1966 to 1986, Ontario has consistently urbanized the most rural land of any province and has been responsible for 35% of all rural land converted. Quebec converted a further 18%, Alberta 17%, and British Columbia 15% (Table 3).

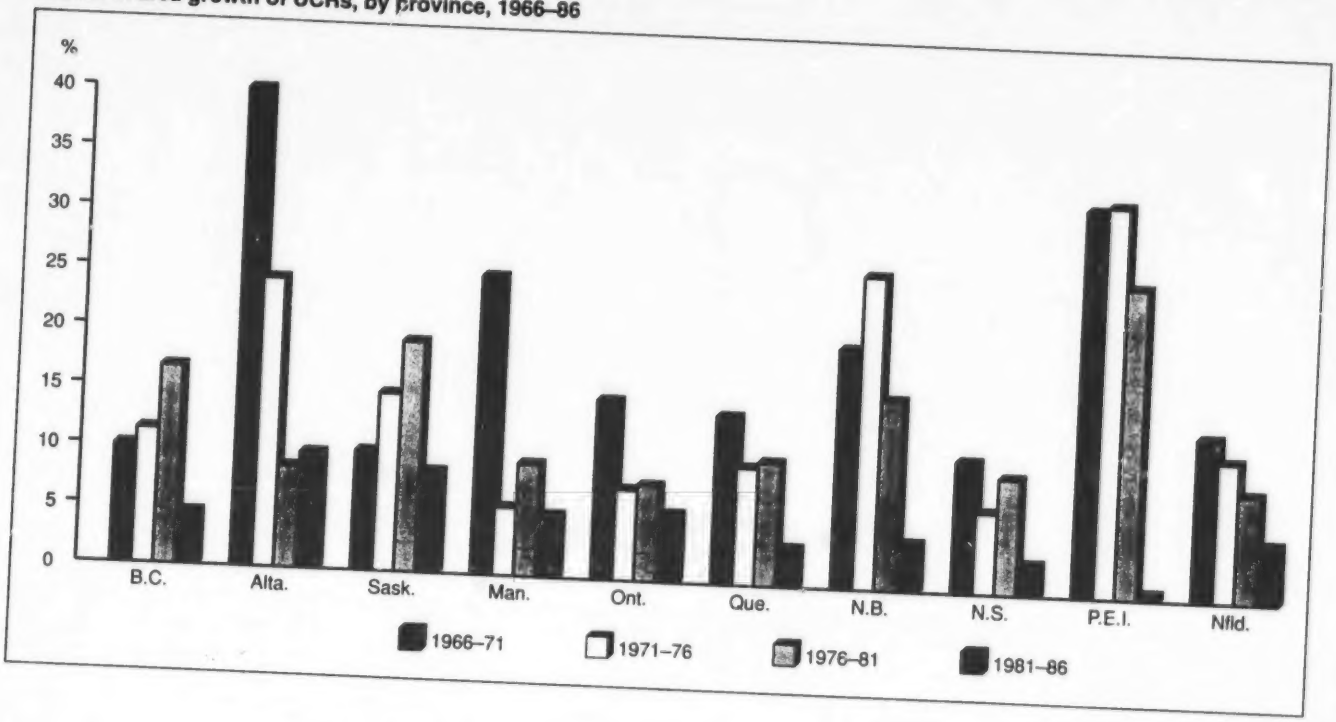
With the exception of the 1976–81 period, Alberta's share of the total rural land urbanized has continued to grow. Quebec's share has declined from approximately 18% during 1966–71 to 11% in the most recent period. Ontario's share declined slightly, from 43% of the national total in the 1966–71 period to 37% between 1981 and 1986. The proportion of the total rural land converted in each of the remaining provinces has remained roughly the same during the four monitoring periods. A total of 174 790 ha of prime capability agricultural land has been urbanized, and Ontario UCRs have converted nearly one-half of this.

Prime agricultural land accounted for more than half of the rural land converted to urban uses in each of the four monitoring periods. Between 1966 and 1981, the proportion of prime agricultural land used for urban growth declined from a high of 63% to a low of just over 50%. However, the trend was reversed in the 1981–86 period, when the percentage of prime agricultural land urbanized rose to 59%. In Ontario, the proportion of prime agricultural land in the total converted has remained over 75%. In Alberta and Quebec, the proportion has also been high, ranging from 50% to 73% in Alberta's UCRs and from 42% to 59% in Quebec's.

A consistent trend over the 20-year period has been the greater efficiency of the larger UCRs in converting the lowest proportion of rural land to urban uses per 1 000 increase in population (Table 4). On average, the rate at which smaller centres urbanized rural land compared with their population increase was four times greater than that of the larger centres (196 ha versus 50 ha/1 000 population increase). In fact, the smaller centres are absorbing rural land at ever-increasing rates. During the 1966–71 period, these centres consumed 13% of the rural land urbanized, at a rate of 145 ha per 1 000 population increase, but between 1981 and 1986, these 26 centres converted only 6.0% of the total rural land urbanized, at a rate of 242 ha per 1 000 population increase. This increasing con-

Large amounts of rural land are urbanized during periods of prosperity; less conversion occurs during periods of slower economic growth

Figure 6
Trends in area growth of UCRs, by province, 1966–86



Although most farmers would like to maintain prime agricultural land in production, they also want the option of selling the land for the best price available

sumption of rural land is evident in the sprawl of shopping malls, transportation networks, and low-density residential estates occurring around the smaller centres. The higher conversion rates point to the need for better planning and more efficient land use in these centres.

What of the future?

There is considerable pressure to continue to convert rural land, especially farmland, to urban uses. It is not easy to decide between retaining rural lands for renewable-resource production and allowing urban growth to expand onto these lands. In the short term, building cities and roads on farmland is economically attractive for many people. Municipal governments frequently see urban development as a means of increasing their tax base. Builders prefer the more level, well-drained agricultural land and are willing to pay more than that which can be obtained for agricultural purposes. Although most farmers would like to maintain prime capability land in production, they also want the option of selling the land for the best price available before retirement or during difficult economic periods. In areas surrounding urban centres, the best price is usually for urban purposes.

The consequences of ignoring the loss of prime resource lands may not be immediate, but will affect future generations. A growing Canadian population requires housing and urban employment, and it is difficult to rationalize the maintenance of prime agricultural lands at a time of agricultural surpluses and bankrupt farms. Shortsightedness, however, has its price. Most likely, if the country's best farmland continues to disappear, future Canadians will have no choice but to import, on a year-round basis, many of the specialty crops now grown here. The employment and contribution to Canada's balance of payments made by the agricultural sector would also decline significantly.

Over a 20-year period, 301 440 ha of Canada's rural lands were urbanized to the point where they are no longer capable of renewable-resource production. Some of this change was inescapable. Canada's urban centres will continue to expand as the population grows and economic development advances. However, urban-related growth around many centres can be directed towards areas with lower capability for renewable-resource use. The principle of sustainable development demands that some options for renewable-resource development be retained for future generations.

Table 4
Increase in area, population growth, and rate of conversion of rural land for UCRs, by population class, 1966–86

Population class	Area increase	Population increase	Rate of land conversion
	%	%	ha/1000 change in population
25 000 – 50 000	16.4	6.2	196
50 001 – 100 000	12.5	5.3	175
100 001 – 250 000	13.4	9.9	101
250 001 – 500 000	14.8	14.2	78
> 500 000	42.9	64.4	50
70 UCRs	**41.0**	**33.0**	**74**

Methods

The statistics on rural-to-urban land-use conversion were compiled under the Urban-Centred Regions component of the Canada Land Use Monitoring Program.

Urban-centred regions (UCRs) are urban areas in the 10 provinces with populations of 25 000 or more, based on the 1966 Census of Canada. UCR boundaries are based primarily on Census Metropolitan Areas and Census Agglomerations. Minor boundary modifications have been made to exclude areas where topographic features prohibit potential settlement.

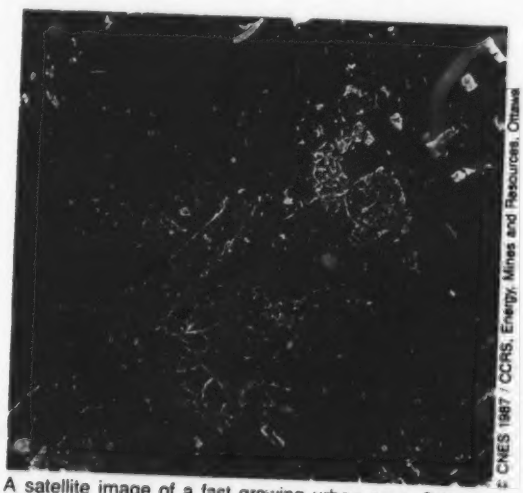
Land activity/cover maps for 1981, at a scale of 1:50 000, prepared from air photographs and selective field checking, provided the baseline data for calculating how much rural land was urbanized between 1981 and 1986. Urbanization information was interpreted principally from 1986 Landsat Thematic Mapper (TM) transparencies, bands 1, 2, and 3, supplemented with other available information.

The TM transparencies were interpreted, and changes from rural-to-urban land use were transferred to overlays of the base map using the Pro Com 2 optical transfer device. Areas of land converted to urban uses were calculated using an electronic planimeter. The 1981–86 rural-to-urban change map was overlaid on the CLI agricultural capability and 1981 land activity/cover maps, and areas of change for these themes were calculated using a similar procedure.

Although the majority of TM images used were taken in 1986, for some centres it was necessary to use 1985 imagery because cloud cover or seasonal differences made urbanized land difficult to identify in the 1986 images. Results obtained from 1985 images were pro-rated to 1986 to permit comparison and aggregation of the land-use data, as well as correlation between area and population statistics (Warren and Rump 1981).

The methods were designed to suit the goal of obtaining nation-wide statistics on the conversion of rural lands to urban uses. TM imagery provided a rapid and economical source for gathering national trend statistics. However, due to low image resolution, low-density urban and urban-related uses on small land parcels and land with dense vegetative covers could not be identified in all cases. Similarly, the "signature" of non-urban uses such as quarries or denuded surfaces sometimes appeared as urban and urban-related uses. Alternative data sources were used to minimize these limitations. The statistics derived give national and regional trends and should not be considered as absolute at the individual UCR level.

The consequences of ignoring the loss of prime resource lands may not be immediate, but will affect future generations



A satellite image of a fast growing urban area, Orleans, Ontario

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For further information

Supplementary tables on urbanization of rural lands, with data for individual UCRs and an assessment of reliability, may be obtained from the following address:

Sustainable Development Branch
Environment Canada
Ottawa, Canada
K1A 0H3

Information on State of the Environment Reporting may be obtained from the following address:

State of the Environment Reporting Branch
Environment Canada
Ottawa, Canada
K1A 0H3

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